Identification of risk factors and microbiological quality of canteen made menus of Maternal home Nº 1 of Rosario city.

Ada B. Seghesso[1]
Dante Frati[2]
Liliana Belá[3]
Carlos Gurrea[1]
Melina Gay[1]
Matías Apa[1]
Dante Impallari[3]
María Julia Chiaudano[4]
Carina Caceres[4]
Carlos Pagni[5]

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1 • Cátedra Salud Pública
2 • Cátedra Epidemiología
3 • Cátedra Higiene de los Alimentos
4 • Comedor Hogar Maternal, Escuela Incorporada N° 1015.
5 • Translation Credits - Cátedra de Ingles
Facultad de Ciencias Veterinarias - Universidad Nacional de Rosario

E-mail: adaseghesso@hotmail.com

Introduction

Feeding of deprived population has a prevailing place in Argentina, infantile malnutrition constitutes a critical problem. Access to harmless food is related to storing conditions, manufacturing, sanitation, water quality and infrastructure of food control.(1) In our country Law 24049/92 stated the transference of educational services to the provinces, with the definitive decentralization of the Maternal-Infantile Nutrition Program (PROMIN). It stated the fund distribution from tax federal co-participation, with specific affectation to scholar canteens with the aim of satisfying claims in nutritional contribution matter, essential basis for growth and development. At present, the most extended way of food assistance is fund transference to scholar institutions where authorities, teachers, cooks, economic administrators or members of the educational community buy foodstuffs and elaborate milk cup, refreshments and the daily menu.(2) Good Manufacturing Practices (GMP) are a tool contributing to assure quality in the production of safe, healthy and harmless foodstuffs for scholar population consumption.

Mercy Society Maternal Homes are located in Rosario city, Santa Fe province, Maternal Home N° 1 was founded on October 9, 1895 by Mrs. Celestina Echagüe de Salvá, with the aim of providing assistance to children of merchants and consumers that attended one of the first markets of the city located in López Square.

The aim of this work was to characterize the building structure, equipment, hygienic sanitary conditions and to link responsible personnel and food handlers knowledge with practices related to handling and cross contamination and the involved risk.

Materials and Methods:

This is a descriptive epidemiological study carried out from March 2013 in the canteen of Maternal Home No.1. A form was designed considering the following variables: health and building conditions, knowledge and practice of handlers and final microbiological quality of processed foods. The information was collected by direct observation of processes and health conditions and interviews to key informants.

Swab samples of hands, kitchen table surfaces, cooked food and water were made to carry out microbiological analyses.

Water samples were obtained according to the established protocol for microbiological analysis of drinking water network.[3] Kitchen table samples were made with sterile swabs starting with a 40 cm per 40 cm surface. Samples were submitted to the laboratories of the Faculty of Veterinary Sciences of the National University of Rosario and to GreenLab Rosario ones, they were put into means of transport, cold conditioned and accompanied by the corresponding protocol. Cooked meat samples were sent to the Laboratory of Food Analyses of the Department of Public Health of the Faculty of Veterinary Sciences of the National University of Litoral.

Analyses made to samples were the following:

Water sampling:

- Total mesophilic aerobic count (AMT): Logarithmic dilutions in base 10 were made using distilled water as diluent. They were sown in Triptein Soy Agar (TSA). Plates were incubated al 37ºC, 24h.
- Total coliforms and *Escherichia coli*: Most Probable Number (MPN) method was used, different water volumes were sown in five tubes containing single and double concentrations of Mac Conkey broth. Total coliforms were incubated at 37ºC, 48h. Positive tubes for detection of *Escherichia coli* were incubated at 44.5ºC, 48h.
- *Pseudomona aeruginosa*: Seeding was made in Tripticase Soy broth and incubated at 37ºC, 24h, after it was picked in Levine Medium and the isolated colonies were picked in Agar Cetrimide at 37ºC, 24h.
- Analytical methodology corresponding to Standardized Methods for drinking and waste waters were used for physical and chemical analyses.[4]

Swabs:

- AMT count: Swabs were discharged into the diluent. Logarithmic dilutions in base 10 were made using distilled water as diluent. They were sown in TSA. Plates were incubated at 37ºC, 24h.
- *Escherichia coli* and total coliforms: Levine agar was used and incubation was made at 37ºC, 24h.
- *Salmonella spp*: Xylose-Lysine-Deoxycholate (XLD) agar was used, and incubated at 37ºC, 24h.

Cooked Food Samples:

- *Salmonella spp*: It was made according to the methodology reported by FDA/BAM and ISO 6579. Meatloaf, ravioli and chicken supreme samples were homogenized with a stomacher (Seward biomaster®) in 225 ml of peptone buffered water (Oxoid). After 18h, at 37ºC, 1 ml of culture was sown in 9 ml of Tetrathionate broth (Oxoid), and 0.1 ml (distributed in 3 drops) in semisolid Rapapport plates (Oxoid). Both cultures were incubated at 45ºC, 24±3h. Mobile *Salmonella* colonies are characterized because they create a gray-whitish cloudy zone irradiating from the inoculation point. Zones are surrounded by a white halo with clearly defined edges.

Presumptive colonies in semisolid Rapapport and Tetrathionate broth were sown in plates containing XLD selective medium and incubated at 37ºC, 24h.

Fungus, yeast, AMT, total coliforms and enterobacterium count was carried out according to the methodology reported by FDA/BAM. Meatloaf, ravioli and chicken supreme samples (10 g) were homogenized with a stomacher (Seward biomaster®) in 90 ml of peptone water (Oxoid). Seedings in triplicate from dilution series of each sample were made in culture media under the conditions shown in Table 1.

Medium	Main listed micro organisms	Time of incubation (d)	Atmosphere and incubation temperature
PCA (Britania)	Total mesophilic aerobics	2	37 °C, aerobiosis
HyL (Britania)	Fungi and yeasts	5	25 °C, aerobiosis
VRBL (Merck)	Total coliforms	1	37 °C, aerobiosis
VRBG (Oxoid)	Total enterobacteria	1	37 °C, aerobiosis

Table 1: Means of culture and methods for intestinal microorganisms.

Results:

The canteen was located on the ground floor of the Built School N° 1015 where 534 students from the city deprived areas attended. Two hundred and seventy four daily rations were prepared and consumed at lunch by elementary and kindergarten pupils and 704 cups of milk were distributed in two shifts, from this total 104 cups were consumed by secondary level pupils.

Roofs throughout the building were made of masonry, walls had a sanitary covering in good state of preservation, tiled floors with baseboards, openings had protection against insects, lighting was natural and the artificial one had big lighting panels without antiblast protection. It had drinking water network kept in two tanks washed every 6 months by a private company which also made pest control.

Dining room was provided with six big marble tables, wood and iron benches screwed into the floor, two wall fans and four heating screens. The kitchen had a marble table, another stainless steel one with double sink and hot/cold water supply. Stainless steel equipments were in a very good state and composed of an industrial kitchen with four burners and oven containing two trays, an industrial cook top with two burners, a pizza oven with three trays, a fryer and a cheese grater. A stainless steel cooking fume extractor was located over the fire zone, and an external extractor on the north faced wall, a stainless steel covered table was located in the centre. Two masonry tile covered shelves in which utensils were kept on granite shelves were located on the west faced wall. Washing sector was provided by a stainless steel kitchen table with two big sinks with hot/cold water. Dishes were kept in a synthetic enamel painted wood cupboard. The Warehouse was divided into two sectors, the economy office where suppliers were received was located in the first one, but there also were two commercial stainless steel refrigerators with four doors where perishable foods were kept and a freezer used as a refrigerator. A scale was hanged from the ceiling, some non-perishable food ordered according to time of arrival were kept on shelves. A door opened to the other section, a white tile covered kitchen table having two sinks and a cold water faucet was attached to the wall. There was a stiff slicer on the upper part, cleaning products were under the kitchen table. Toilets and locker room were physically separated from the food manipulation area and had liquid soap and paper towels.

The Management Team of the educational Institution supervised and coordinated the activities of the establishment next to the person in charge of economy who was a Technician in Nutrition and Food and scheduled menus, made and controlled the supply and raw materials shopping. Menus were elaborated according to the suggestions of the Operating Manual for services of school canteen and cup of milk.[5]

Handling, cooking, service and cleaning tasks were done by five handlers having more than 15 years doing the same function. All had a uniform composed of an apron, headdresses were not always used by them, gloves were not used by 50% of them, all had health book available in the Institution, they had received formal government training in 2004, and they did not have food handler license. They knew and applied criteria on right temperatures for food cooling and cooking. Hygiene, food separation, order in deposits and cool equipments were adequate. Utensil, equipment and facility

cleaning was daily done, a deeper cleaning was done twice a week using approved cleaning products. All applied pre and post operational correct hand washing. They did not go work when they were sick and were replaced by temporary staff.
Laboratory analysis results are shown in Tables 2, 3 and 4.

Samples	Determination	Informed value	Argentine Food Code requirement
Meat loaf	Total mesophilic aerobics	2,95 102 UFC/g ± 2,12 101	n=5 c=2 m=104 UFC/g M=105 UFC/g
	Total coliforms	< 10 UFC/g	n=5 c=2 m=100 UFC/g M= 500 UFC/g
	Total enterobacteria	< 10 UFC/g	No reference
	Fungi and yeasts	< 10 UFC/g	No reference
	Salmonella spp	None in 25 g	n= 5 c=0 Ausencia/25 g
Ravioli	Total mesophilic aerobics	1,20 102 UFC/g ± 1,41 101	n=5 c=2 m=104 UFC/g M=105 UFC/g
	Total coliforms	< 10 UFC/g	n=5 c=2 m=100 UFC/g M= 500 UFC/g
	Total enterobacteria	< 10 UFC/g	No reference
	Fungi and yeasts	< 10 UFC/g	No reference
	Salmonella spp.	None in 25 g	n= 5 c=0 None/25 g
Chicken supreme	Total mesophilic aerobics	6,85 103 UFC/g ± 7,778 102	n=5 c=2 m=104 UFC/g M=105 UFC/g
	Total coliforms	< 10 UFC/g	n=5 c=2 m=100 UFC/g M= 500 UFC/g
	Total enterobacteria	< 10 UFC/g	No reference
	Fungi and yeasts	< 10 UFC/g	No reference
	Salmonella spp.	None in 25 g	n= 5 c=0 None /25 g

Table 2: Laboratory results of cooked food analysis. (Laboratory of Food Analysis. Department of Public Health. Faculty of Veterinary Sciences. National University of Litoral.

Samples	Total mesophilic aerobics	Total coliforms	*Escherichia coli*	*Salmonella spp.*	*Pseudomona aeruginosa*
Hand swab	100 UFC/ml	Negative	Negative	Negative	----------
Countertop surface swab	20 UFC/ml	Negative	Negative	Negative	----------
Countertop with sink surface swab	80 UFC/ml	Negative	Negative	Negative	----------
Water tank	120 UFC/ml	Negative	Negative	Negative	Negative
Drinking water	50 UFC/ml	Negative	Negative	Negative	Negative

Table 3: Results of laboratory and microbiological water swab analysis. (Laboratory of Microbiology. Faculty of Veterinary Sciences. National University of Rosario)

Parameter	Resultado
Turbidity	<1 UNF
Color	11/m
Odour	Not unpleasant
Ph	7.6
Total disolved solids	199 mg/l
Total alkalinity	50 mg/l
Total hardness	58 mg/l
Chlorides	35 mg/l
Sulphates	56 mg/l
Manganese	<0.05 mg/l
Iron	<0.05 mg/l
Ammonia	<0.010 mg/l
Nitrates	3 mg/l
Nitrites	<0.005 mg/l
Fluoride	0.37 mg/l
Arsenic	<0.010 mg/l
Plumb	<0.05 mg/l
Connectivity	280 uS/cm

Research notes:
Analyzed parameters are within the established limits.

Table 4: Analysis results of physical-chemical laboratory of water (Greenlab Laboratory Rosario)

Discussion:

Risk factors related to building conditions were detected, on one hand due to building age, and on the other hand because of the lack of lighting protection. It is important to note that drinking water supply, cleaning routine, activity organization and food adequate handling represent a strength contributing to safe food elaboration, what is shown by results obtained in microbiological analyses.
Although all the staff has received food handling formation, the lack of continuity on training was evident in the difficulty to relate knowledge with practices linked to handling and cross contamination and the risk implied by them.

Bibliography:

(1) Centro de Estudios sobre Nutrición Infantil. Programas Alimentarios en Argentina. 2003
(2) Centro Interamericano para el Desarrollo Social de la Organización de los Estados Americanos. Evaluación de un Programa de Alimentación Escolar: El caso Argentino.1985.
(3) Ministerio de Agricultura, Ganadería y Pesca de la Nación. INTA. Protocolo de Muestreo, Transporte y Conservación de Muestras de Agua con Fines Múltiples: consumo humano, abrevado animal. 2011. http://inta.gob.ar/sites/default/files/script-tmp-protocolo_de_muestreo_de_aguas_inta.pdf
(4) APHA, AWWA, WEF. Standard Methods for examination of water and wastewater. 22nd ed. Washington: American Public Health Association; 2012, 1360 pp. ISBN 978-087553-013-0. http://www.standardmethods.org/
(5) Ministerio de Educación de la Provincia de Santa Fe. Resolución Ministerial N° 0511/2001. Manual operativo de funcionamiento para los servicios de Comedor escolar y copa de leche.